

What is claimed is:

1. A refrigerating system using a non-azeotropic refrigerant mixture, wherein

the non-azeotropic refrigerant mixture comprises a refrigerant having a normal boiling point of approximately room temperature and a low-boiling-point refrigerant having a normal boiling point of  $-60^{\circ}\text{C}$  or less;

the refrigerating system is a single-stage refrigerating system comprising a compressor, a condenser, an evaporator, and a heat exchanger for exchanging heat between a refrigerant in a path from the evaporator to the compressor and a refrigerant in another path from the condenser to the evaporator;

a dew point of the refrigerant mixture at a pressure in the condensing process after the compression is above room temperature; and

the refrigerating system is operated in the range in which the boiling point is higher than the dew point at a pressure in the lower-pressure region in the path from the evaporator to the compressor.

2. A non-azeotropic refrigerant mixture used in a single-stage refrigerating system comprising a compressor, a condenser, an evaporator, and a heat exchanger for exchanging heat between a refrigerant in a process from the evaporator to the compressor and a refrigerant in a path from the condenser to the evaporator, wherein

the non-azeotropic refrigerant mixture comprises a refrigerant having a normal boiling point of approximately

room temperature and a low-boiling-point refrigerant having a normal boiling point of  $-60^{\circ}\text{C}$  or less;

a dew point of the refrigerant mixture at a pressure in the condensing process after the compression is above room temperature; and

the boiling point is higher than the dew point at a pressure in the lower-pressure region in the path from the evaporator to the compressor.

3. The non-azeotropic refrigerant mixture for ultra-low temperature according to claim 2, wherein

the high-boiling-point refrigerant gas having a normal boiling point of approximately room temperature is at least one selected from the group consisting of butane, isobutane, butanes, R134a, and ethylacetylene; and

the low-boiling-point refrigerant gas having a normal boiling point of  $-60^{\circ}\text{C}$  or less is at least one selected from the group consisting of ethane, ethylene, and R-14.

4. The non-azeotropic refrigerant mixture for ultra-low temperature according to claim 3, wherein

the high-boiling-point refrigerant gas having a normal boiling point of approximately room temperature is butane or isobutane;

the low-boiling-point refrigerant gas having a normal boiling point of  $-60^{\circ}\text{C}$  or less is ethane or ethylene; and

the characteristics are improved by adding R-14 (perfluoromethane) to the gas mixture.

5. The non-azeotropic refrigerant mixture for ultra-low temperature according to claim 4, wherein

the high-boiling-point gas is butane and the low-boiling-point gas is ethane;

5 the mixing ratio of the butane-ethane gas mixture is in the range from 90/10 to 60/40; and

the content of R-14 (perfluoromethane) in the gas mixture is between above 0% and 9%.

10 6. The non-azeotropic refrigerant mixture for ultra-low temperature according to claim 4, wherein

the high-boiling-point gas is butane and the low-boiling-point gas is ethylene;

15 the mixing ratio of the butane-ethylene gas mixture is in the range from 90/10 to 70/30; and

the content of R-14 (perfluoromethane) in the gas mixture is between above 0% and 0.7%.

20 7. The non-azeotropic refrigerant mixture for ultra-low temperature according to claim 4, wherein

the high-boiling-point gas is isobutane and the low-boiling-point gas is ethane;

the mixing ratio of the isobutane-ethane gas mixture is in the range from 90/10 to 70/30; and

25 the content of R-14 (perfluoromethane) in the gas mixture is between above 0% and 15%.

8. The non-azeotropic refrigerant mixture for ultra-low temperature according to claim 4, wherein

the high-boiling-point gas is isobutane and the low-boiling-point gas is ethylene;

the mixing ratio of the isobutane-ethylene gas mixture is in the range from 90/10 to 80/20; and

5 the content of R-14 (perfluoromethane) in the gas mixture is between above 0% and 10%.